BOOK REVIEWS

SUPERNOVAE, by I. S. Shklovsky, John Wiley and Sons, London, 1968.

Volume XXI in the series Interscience Monographs and Texts in Physics and Astronomy.

Price $ 20.20

This publication is an authoritative monograph on supernovae, the various problems connected with the causes of supernova explosions, their evolution and physical understanding of the complex processes occurring in the nebula. This information is now obtained through optical, radio and X-ray astronomy. The frequency of the occurrence of supernovae in a galaxy is a debatable point but roughly it can be taken to be about one in 300 years. In the monograph a description of all the supernovae which have been recorded so far is given. These supernovae can be divided into various types depending upon the shape of their photographic light curves. In supernovae of type I, there is a sudden increase in the luminosity followed by a gradual decrease. In supernovae of type II, the curve has a broader maximum than that of type I.

The supernovae of the type II are relatively young objects with sufficiently large masses and during explosion the ejected shells may be of mass greater than 100 $M_\odot$. The fine-fibred nebula in Cygnus is an example. A detailed discussion of all the known supernovae of type II is given. Their optical characteristics, radio-frequency emission and the decrease in flux and intensity, shock waves in interstellar medium caused by the outbursts and the influence of the magnetic fields on the characteristics of remnants are described.

The Crab nebula belongs to remnant of type I supernova This nebula has been studied most carefully due to its relative proximity and also due to the presence of the powerful synchrotron radiation. The flux density and polarisation of the radiofrequency radiation have been studied and various interpretations given. The Crab nebula consists of thin filaments arranged in the form of a shell surrounding the central part of the nebula. An analysis of the emission from this part shows that the emission is thirty times brighter than the emission from the filament and has a purely continuous spectrum. The analysis of the photographs shows that it has not been possible, so far, to explain the structure and the characteristic rates of change. From the study of the spectrum in the entire frequency range, attempts have been made to discuss problems like the age and the magnetic field strength. The most important result is the proof that relativistic electrons of high and super-high energies are still being produced at present in Crab nebula.

The study of supernovae is also connected with the problem of the origin of primary cosmic rays, that is the source of the relativistic portons and heavy neclei. The author also discusses various theories which have been advanced to explain the causes of supernova explosion. This problem is also connected with the evolution of stars and their catastrophic collapse. Much work is being done on these problems. In this respect the book will prove to be very valuable to the students of modern astrophysics.

F. C. A.

DIFFUSE MATTER IN SPACE, by L. Spitzer, Jr., Interscience Publishers, John Wiley & Sons, New York, 1968. Pp 212 + XIII, Price $ 11.50

The interstellar material plays a major role in the evolution of stars and the galaxies. It is known that new clusters are born within the interstellar clouds, and ejection of matter from old stars, especially from supernovae, enriches the interstellar gas with atoms of heavy elements. Here various physical processes occur which are not encountered in stellar atmospheres. There are enormous deviations from thermal equilibrium and the time scales for dynamical processes are much longer than the time scale for radiation cooling. The interaction between the energetic ions and the magnetic field pose interesting and difficult problems.

The book gives an introduction to this subject of interstellar material. The first three chapters provide the necessary observational data obtained with optical or radio telescopes and these data are interpreted in terms of the density and velocity distribution of the absorbing or emitting atoms, ions, molecules or solid grains. A number of major features in the interstellar emission or absorption spectra are due to hydrogen. The 21 cm line of neutral hydrogen is emitted primarily from H I region. In H II region collisions between electrons and portons lead to emission of continuous radiation and recombination both in visual and radio regions. The information from absorption lines complements that obtained from the emission lines The non-thermal emission given by relativistic electrons provides the interstellar magnetic field. As radiation passes through a region of space containing solid particles, or grains, the radiant energy is scattered or converted into heat by absorption. This extinction process of scattering and absorption depends on the geometrical shape of the grains, the simplest shapes being spheres, cylinders and spheroids. Polarisation has been measured for a number of stars, and its dependence on wavelength, Galactic longitude observed. The spectral distribution of interstellar matter shows non-uniformity in the solar neighbourhood.

The physical processes which are associated with encounters between various types of interstellar particles and which determine ionization level, and the velocity distribution of the atoms, and the size, composition and orientation of the grains are the subject matter of chapter four. The dynamics of the interstellar gas like appearance of shock fronts and ionization fronts expansion of H II regions, the explosion of supernova and the interaction between clouds and stars are discussed in chapter five. The last chapter deals with the problem of formation of stars in galaxies, gravitational instability, fragmentation of a collapsing cloud and physical properties of the stellar material as its density increases.

The book will be found invaluable for students of astro-physics interested in the subjec of interstellar matter.

F. C. A.

Lectures on The Theory of Normal Metals delivered at the Centre for Advanced Study in Physics, Delhi University, Delhi (India).

by Acad. A. A. Abrikosov, Institute of Theoretical Physics, Academy of Science, U. S. S. R. ;

Hindustan Publishing Corporation (India), Delhi-7, India. 1968. Price Rs. 35.00.

The book is based on a course of lectures which the distinguished author delivered at the Department of Physics and Astrophysics of the Delhi University. The usually important topics like the electronic spectra of metals, conductivity (thermal and electrical), galvanomagnetic effects, behaviour of metals in high frequency fields and absorption of sound are dealt with. The approach to the different topics are fundamental and rigorous and many of the treatments are novel. Further he has discussed many newly discovered phenomena to show how these can be utilised for obtaining the electronic spectra of metals. This book, inspite of the presence of some good works on the subject in the field, will be very useful to both theoretical and experimental workers on metal physics and allied lines.

The reference system of the book needs improvement.

A. K. D.